AMENDMENT NO. 1 JULY 2021

TO

IS 7436 (PART 2) : 2019 GUIDE FOR TYPES OF MEASUREMENTS FOR STRUCTURES IN RIVER VALLEY PROJECTS AND CRITERIA FOR CHOICE AND LOCATION OF MEASURING INSTRUMENT

PART 2 CONCRETE AND MASONRY DAMS

(Second Revision)

(*Page* 1, *clause* **2**) — Insert the following entries at an appropriate place:

IS No.	*Title*
3025 (Part 1) : 1987	Methods of Sampling and test (Physical and chemical) for water and wastewater: Part 1 Sampling
4032 : 1985	Method of chemical analysis of hydraulic cement
9108 : 2020/ ISO 1438 : 2017	Hydrometry — Open channel flow measurement using thin-plate weirs

(*Page 2 clause* **4.2.1)** — Insert the following new clause and renumber the subsequent clauses :

‘4.2.2 Seepage shall be measured by fixing standard ‘V’ notches having angle 90° which may preferably be used for measurement at the end of each block or at feasible locations. The guidelines stipulated in IS 9108 shall be followed in installation, measurement and maintenance of ‘V’ notches.’

Price Group 2

(*Page* 4**,** *clause* **4.9**) — Insert the following new clause and renumber the subsequent clauses.

‘4.10 Measurement of Lime Leached quantity by Chemical Analysis

4.10.1 Leaching, together with freeze-thaw is the most common degradation problem in masonry concrete dams. River water is often relatively free from dissolved ions (soft water). Such water is aggressive to concrete structures because of the dissolving ability. So, the knowledge of about how to predict leaching damages is needed. Water may be mostly good for the continuous hydration; on the contrary, water may also start to dissolve hydration products in the masonry concrete of dams. Water will dissolve soluble hydrated products and will carry the dissolved materials namely, calcium hydroxide out of the structure. Thus, the quantum of the leached lime shall be quantified block wise. The chemical method of quantifying the lime leached will enable to decide the quantity of lime to be replaced and the location to be replaced.

4.10.2 *Illustration for Location of Sampling and Measurement of Flow at Drainage Gallery of the Dam*

Consider that there are 15 Nos. of V- Notches in the dam. Figure. 1 shows the flow of seepage water from the dam. The sump is located in between V5 and V6 and seepage water gets collected in the sump from where it is pumped out. The rate of seepage is measured at all 15 V-Notches and recorded as in Table 1. The rate of seepage measured collectively shall be calculated to reflect the quantity of flow through each V notch as detailed in Table 1.

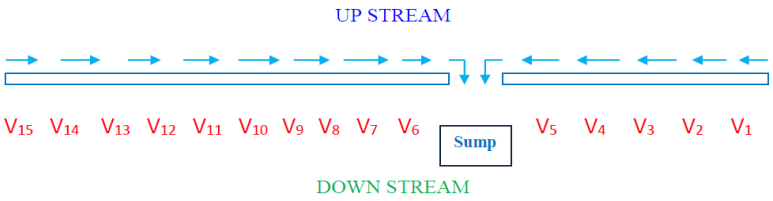

FIG. 1 FLOW OF SEEPAGE WATER FROM THE DAM

Table 1 Illustrative Table for Calculation of Actual Rate of Seepage

(*Clause* 4.10.2)

Sl. No.	Rate of Seepage Measured (l/m)		Actual Rate of Seepage of Respective V-Notechs (l/m)	
	Location	Quantity	Location	Quantity
(1)	(2)	(3)	(4)	(5)
1	V1		V1	V1
2	V2		V2	V2-V1
3	V3		V3	V3-V2
4	V4		V4	V4 - V3
5	V5		V5	V5 - V4
6	V15		V15	V15
7	V14		V14	V14 - V15
8	V13		V13	V13 - V14
9	V12		V12	V12 - V13
10	V11		V11	V11 - V12
11	V10		V10	V10 - V11
12	V9		V9	V9 - V10
13	V8		V8	V8 - V9
14	V7		V7	V7 - V8
15	V6		V6	V6 - V7

4.10.3 *Sample Collection for Chemical Analysis*

a) Samples for chemical analysis shall be collected for each representative block.

b) General instruction as given in IS 3025 Method of sampling and test (physical and chemical) for water used in industry shall be followed.

c) The water sample shall be collected, wherever possible, directly from the porous concrete drainage shafts and from the foundation pressure relief pipes, as otherwise subsequent precipitation due to contact with the atmosphere can significantly reduce the Calcium hydroxide content of the sample.

d) The samples collected shall be labeled and tested as soon as possible. Samples shall be taken in polythene bottles and sealed properly. The bottle shall be completely filled.

e) Integrated samples for reservoir shall also be collected from a point not less than 100 m from face of dam. (Integrated samples are collected by taking a few samples from different locations and mixed as one sample). The sample collected at any location shall be a integrated sample at a depth of 0.6 d.(where d is the depth of storage)

f) Periodic assessment of parameters namely, *p*H, $CaCO_3$, saturated *p*H, Conductivity, dissolved oxygen, ammonia, TDS, salinity, temperature, mineralogical analysis and others parameters which can be measured at site itself will be carried out.

4.10.4 After chemical analysis of collected samples, the monthly statement of lime leaching test result of seepage gallery water sample shall be reported in the format furnished as given in Table 2.

Table 2 Statement of Lime Leaching Test Results of Seepage Gallery Water Samples from Dam for the Month of

(*Clause* 4.10.4)

Sl No.	Date of Sample Collection	Reservoir Level (m)	Rate of Seepage (l/min)	Particulars of Sample	Suspended Solids (mg/l)	Lime as $CaCO_3$ (mg/l)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
i)				Shafts representative of V Notch 1		
ii)				Shafts representative of V Notch 2		
iii)				Shafts representative of V Notch 3		
iv)				Shafts representative of V Notch 4		
v)				Shafts representative of V Notch 5		
vi)				Shafts representative of V Notch 6		
vii)				Shafts representative of V Notch 7		
viii)				Shafts representative of V Notch 8		
ix)				Shafts representative of V Notch 9		
x)				Shafts representative of V Notch 10		
xi)				Shafts representative of V Notch 11		
xii)				Shafts representative of V Notch 12		
xiii)				Shafts representative of V Notch 13		
xiv)				Shafts representative of V Notch 14		
xv)				Shafts representative of V Notch 15		

4.10.5 *Chemical Analysis of Lime Deposit*

The lime that have deposited in drains may also be scraped, dried and weighed periodically (that is quarterly or half yearly). Keep the month of scraping constant so that the rate of deposition from a particular drainage shaft (block wise) may be arrived. Lime deposit records would be maintained for recording the weight of the scraped lime from drains.

Record the weight shaft wise separately. Send 100 g of Lime deposit for chemical analysis to know the nature and composition of the deposit. The chemical analysis of Lime deposit shall be carried out as per IS 4032 to find out lime content (CaO). The quantity of lime deposit calculated has to be added to total lime loss for estimation of lime leached out from the dam.

4.10.6 From the analysis report furnished, the lime leached quantity shall be calculated as given below and shall be recorded as given in Table 3.

Table 3 Computation of Lime leached from Chemical Analysis of Seepage gallery water sample

(*Clause* 4.10.6)

Sl No.	Month and Year	Reservoir Level (m)	Rate of Seepage l/min	Quantity of Seepage l/month	Gallery Water $CaCO_3$ mg/l	Reservoir Water $CaCO_3$ mg/l	Diff. in $CaCO_3$ mg/l	CaO (mg/l)	Lime Leached in kg
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)

NOTE

1 Quantity of seepage water (Gallery water) = Rate of seepage in LPM × 60 × 24 × No. of days (in litre)

2 Lime content (CaO) = (Quantity. of lime in gallery water − Quantity of lime in Reservoir water) × 0.56 (in mg/l)

3 Lime Leached out = $\frac{\text{Quantity of Seepage} \times \text{Lime Content (in Kg)}}{1000 \times 1000}$

When the lime content of reservoir water is more than the Gallery water the quantity of lime leached out should be taken as NIL.

4.10.7 *Estimation of Lime leached from the Dam*

Percentage of Lime leached out in N years

$$P_L = \frac{W_L \times 100}{W_{LC}}$$

where

P_L = percentage of lime leached out in N years ;

W_L = total quantity of lime leached for N years in MT (from water sample and lime deposit) ;

W_{LC} = quantity of lime in cement (in metric tonne) ; $W_{LC} = W_c \times \frac{62.5}{100}$;

W_C = total quantity of cement used for construction of the dam in metric ton (actual field data from the record).'